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ABSTRACT

This course guide is intended for classroom use by teachers of secondary level mathematics to Spanish-speaking students of English as a second language (ESL). Both mathematical instruction and acquisition of English mathematical terminology are emphasized. The book is divided into chapters that comprise a Spanish-English glossary of mathematical terms, simple exercises involving the Roman and Mayan number systems, consumer arithmetic, fractions, decimals, positive and negative numbers, sets, graphs, equations, and geometry. (JB)

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A Handbook

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SET	{ }	EL CONJUNTO
EQUALS	=	IGUALAR
DOES NOT EQUAL	≠	NO ES IGUAL
IS A MEMBER OF	∈	ES MIEMBRO DE
IS NOT A MEMBER OF	∉	NO ES MIEMBRO DE
EMPTY SET	∅	CONJUNTO VACIO

Secondary Level

for Mathematics

Teaching English as a Second Language

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HOUSTON INDEPENDENT SCHOOL DISTRICT

HOUSTON, TEXAS

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TEACHING ENGLISH AS A SECOND LANGUAGE

A HANDBOOK

FOR

MATHEMATICS

Curriculum Bulletin Number 75CBM4

Secondary level

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INTRODUCTION

The Spanish-speaking student who has limited English-speaking ability will be able to master certain mathematics skills quickly and thoroughly since on the math level there is no language barrier. The number system and the system of mathematical computation use terminology common to both English and Spanish languages. Further, in mathematics classes more often than in other subject areas, visual concepts and skills are provided in the usual presentation of the material.

One of the easiest language-learning tasks is that of naming numbers and geometric figures. A list of such terms is included. They are constant and abstract. With a careful introduction and repetition of the correct pronunciation (requiring oral duplication by the student), recognition and proper pronunciation are soon achieved. The Spanish translations are not necessary except, perhaps, for study at home.

These lessons touch upon several areas of mathematics. Beyond their obvious utility at particular phases of the curriculum, they can be used as models for presentation of other lessons to students who have limited English-speaking ability.

Suggestions:

- Emphasize the oral language. Model terms and phrases repeatedly. Have students respond orally.
- Use visual representations of new terms wherever possible.
- Be tolerant of number manipulations that might be different from the expected ones (e.g., the division problem).
- Emphasize the specialized nature of the language of mathematics. In word problems, for example, certain terms and phrases are expected (If...then., When...?, How much...?, etc.).
- Include materials beyond the textbook which will serve as resources for teaching mathematics and culture; i.e., newspaper advertisements (simple math problems and budgeting), stock market reports (graphing and projections).

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FOREWORD

The lessons included in this section will coincide with the Secondary Mathematics curriculum and can be incorporated into the regular sequence of presentation. Further, since ESL methodology is employed throughout, they can be used as models for structuring other lessons.

Depending upon his command of the Spanish language, the individual teacher can choose to what extent he will use the bilingual components of the lessons. In addition to the lessons in the mathematics section, other sections included in the Secondary Bilingual Handbook have lessons appropriate for math instruction: The Metric System in the science section and Logical Sequence in the language arts section.

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MATHEMATICS TERMS

ENGLISH	SPANISH
abacus	ábaco
about	aproximadamente
about how much	aproximadamente que tanto
to add	sumar
addends	sumandos
addends, missing	sumandos faltantes
adding a number	adición de un número
less than ten	menos que diez
addition	adición
alphabet	alfabeto
arrow	flecha
associative property of addition	propiedad asociativa de la adición
at the cost of	a razón de
average	promedio
bar graph	gráfica de vara
base	base
base ten	base diez
basic facts	combinaciones básicas
bi-conditional	bi-condiciones
condition	condición
both factors greater than ten	ambos factores mayores que diez
can	podemos
cannot	no podemos
cardinal numbers	números cardinales
century	siglo
chapter test	examen del capítula
chart	carta
checking subtraction	comprobación de la sustracción
choices	elecciones
clock arithmetic	reloj aritmético
clock equation	ecuación de reloj
closed sentences	oraciones cerradas
columns	columnas
commutative property of addition	propiedad conmutativa de la adición
commutativity	conmutatividad
compact numeral	numeral compacto
compare	compara
comparing sets	comparando conjuntos
complete these examples	completa estos ejemplos
data	datos
decade	década
describe	describir
diagram	diagrama
difference	diferencia
digits	dígitos
distributive property	propiedad distributiva

elements	elementos
equals	son
equation	ecuación
equations and functions	ecuaciones y funciones
equivalent	equivalente
estimate the cost	estima el costo
even numbers	números pares
expanded	desarrollado
expanded notation	notación desarrollada
expanded numeral	número desarrollado
extending addition	extensión de adición
factor product multiplication	factor producto multiplicación
factors of ten	factores de diez
family of facts	familia de datos
false	falsa
five step problem solving method	método de resolver problemas en cinco pasos
form	forma
four step method	método de cuatro pasos
function	función
graph	gráfica
greater numbers	números mayores
Hindu-arabic numerals	numerales indo-arábigos
how many	cuántos
if	si
identifying set with objects	identificación de conjuntos con objetos
inequalities	desigualdades
interval	intervalo
inverse operations	operaciones inversas
is not equal to	no es igual a
is not greater than	no es mayor que
is not less than	no es menor que
joining	agrupación
joining	unión
joining sets	unión de conjuntos
joining two equivalent sets	unión de dos conjuntos equivalentes
less	menos
less than and greater than	menor que y mayor que
left	izquierda
lesser numbers	números menores
line	recta
linesand line segments	rectas y segmentos de recta
linear measurements: unit, measure, length	medición lineal: unidad, medida, longitud
lines and curves	rectas y curvas
list	listar
listing	alistamiento
long form, short form	forma larga, forma corta

making number sentences	formación de oraciones numéricos
matches	aparea
measurement	medida
measuring in inches	medición en pulgadas
measuring to a half inch	medición hasta el medio pulgada
median	mediana
minus	menos
missing addend	el sumando que falta
missing digits	dígitos faltantes
missing factors	factores faltantes
more	más
moving to the right on the number line	movimientos a la derecha sobre la recta numérica
multiples	múltiplos
multiples of ten	múltiplos de diez
multiplication	multiplicación
multiply	multiplicar
names for numbers	nombres para unos números
naming missing addends	nombrar sumandos que faltan
necessary	necesario
none	ningún
numbers	números
number facts	datos numéricos
number line	recta numérica
number of pairings	número de aprareamientos
number pairs	parejas de números
number patterns	tablas numericas
number plane	plano numérico
number sentences	oraciones numéricas
numeral	numeral
numeration	numeración
objects	elementos
objects	objetos
odd and even numbers	números pares e impares
one factor between ten and twenty	un factor entre diez y veinte
one half, half units	un medio, medios
one to one correspondence	correspondencia uno a uno
open sentence	oración abierta
opposite operation	operación opuesta
opposites	opuestas
order of the numbers	orden de los números
order on the number line	orden en la recta numérica
order pair	un par ordenado
ordered pairs	pares de números ordenados
ordinal numbers	números ordinales
origin	origen
paired pairings	apareado apareamientos
pair	aparear
patterns	modelos
pattern	modelo, diseño
placeholder	número que guarda el lugar de otro
liquid measurements: pint, quart, gallon	medición de líquidos: pinta, cuarto de galón, galón

points and lines	puntos y rectas
propositions	proposiciones
ray	rayo
remainders	residuos
rename	volver a nombrar
renaming ten ones	otro nombre para diez unidades
resolve	resuelve
review	repaso
right	derecha
rod	barra
rods	barras
Roman numerals	numerales romanos
row	fila
rule	regla
score	cuenta, resultado
second	segundo
Secret code	clave secreta
separating	separando
separating sets	separación de conjuntos
set of solutions	conjunto de soluciones
sharpshooting	agilidad mental
short form	forma corta
short method	método corto
show	indicar
so, expanded form	así que, forma desarrollada
solution	solución
solve	resolver
some	algunos
statements	proposiciones
steps	pasos
subjects	asignaturas
substitute	sustituir
subtract	restar
subtraction	sustracción
sufficient condition	condiciones suficientes
sum	suma
symbol	símbolo
system of numerals	sistema de numerales
tables	tablas
tens	decenas
tens and ones	decenas y unidades
tens, numerals, order	decenas, numerales, orden
then	entonces
three addends	tres sumandos
three-place addition	adición de tres dígitos
time-half an hour	tiempo-media hora
times	por
true	verdadera
two-digit numerals	numerales de dos dígitos
two number lines addition	dos rectas numéricas adición
two-place addition	adición de números de dos dígitos
two-stage problems	problemas de dos etapas
unit line segments	segmentos de recta unidad

unmatched	sin aparear
using sets and numbers	uso de conjuntos y números
value	valor
vertical form	forma vertical
whole numbers	números enteros
winning	ganancia
writing addition equations	escritura de ecuaciones de adición
writing subtraction equations	escritura de ecuaciones de sustracción
zero	cero

Math Terms by Categories Within the Curriculum

digits	dígitos
name	representar
face value	valor propio
place value	valor de posición
total value	valor total
compact numeral	numeral compacto
expanded numeral	numeral desarrollado
greatest number	número mayor
least number	número menor
whole numbers	números enteros
even numbers	números pares
odd numbers	números impares
ones	unidades
tens	decenas
hundreds	centenas
thousands	millares
billions	millares de millón
columns	columnas
base and place value	base y lugar valorativa
addend	sumando
sum	suma
product	producto
counting numbers	números para contar

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natural numbers	números naturales
ten thousand	diez mil
in all	total
thirty thousand	treinta mil
fifth rod	quinta varilla
thousand	mil
one-hundred-thousand	cien mil
sixth rod	sexta varilla
sums	sumas
millions	millones
ten thousand	decenas de millar
hundred-thousand	centenas de millar
thousand-thousand	millares de millar

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month	mes
first	primero
second	segundo
third	tercero
fourth	cuarto
fifth	quinto
sixth	sexto
seven	séptimo
eighth	octavo
ninth	noveno
tenth	décimo

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metric system of measure	sistema métrico de medida
liter	litro
unit of length	unidad de longitud
centimeter	centímetro
measure	medida
standard unit of measure	unidad normal de medida
standard unit	unidad normal
metric system	sistema métrico

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coins	monedas
penny	centavo
nickle	cinco centavos
dime	diez centavos
twenty	veinte
fifty	cincuenta
one dollar bill	un peso, un dólar
money - penny, nickel, dime	monedas de uno, cinco o diez centavos
amounts of money - coins	cantidades de dinero - monedas
quarters	moneda de veinticinco centavos
half-dollar	monedas de cincuenta centavos
amounts of money	cantidades de dinero
making change	recibiendo cambio

---

fractions	fracciones
fractional numbers	números fraccionarios
one fifth	un quinto
comparing regions	comparación de regiones
one half	un medio
shaded region	región sombreada
total region	región total
whole object	objeto entero
fractional number line	rectas numéricas fraccionarias
one third	tercio
one fourth	un cuarto
three fourths	tres cuartos
quarter of an hour	un cuarto de hora
hundreds and tens	centenas y decenas
denominator	denominador
numerator	numerador
equivalent fractions	fracciones equivalentes

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multiply	multiplicar
factors	factores
product	producto
to pair	aparear
cartesian product	producto cartesiano
cross products	productos cruzados
properties of the multiplication	propiedades de la multiplicación
divisor	divisor
quotient	cociente
remainder	residuo
proof	comprobación

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subsets	subconjuntos
sets	conjuntos
equivalent	equivalente
match	combinar
one to one	correspondencia uno a uno
litter	camada
yoke	yunta
flight	bandada
drove	rábano
train	caravana
members	elementos
braces	llaves
equal	igual
empty set	conjunto vacio
equal set	conjunto igual
infinite	infinito
finite	finito
less than	menos que
greater than	mas que
between	que está entre
equivalent sets	conjuntos equivalentes
pairs of equivalent sets	pares de conjuntos equivalentes
intersection	intersección
union	unión
disjoint	desunido
commutative property	propiedad conmutativa (orden)
associative property	propiedad asociativa
distributive property	propiedad distributiva
common factors	factores comunes
factor	factor
joining subsets	unión de subconjuntos
whole set	conjunto entero
separating sets	separación de conjuntos
size of set	tamaño del conjunto
number of subsets	número de subconjuntos
size of each subset	tamaño de cada subconjunto
number of objects remaining	número de objetos del residuo
separating sets on the number line	separación de conjuntos sobre la recta numérica
part of a set	parte de un conjunto
universal set	conjunto universal

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equation	ecuación
inequality	inigualdad
equality	igualdad
the working form	forma de trabajo
for division	para la división
two step division	división en dos pasos
set diagrams	diagramas de conjuntos
multiples	múltiplos
common multiples	múltiplos comunes
diagrams to show common multiples	diagramas para mostrar múltiplos comunes
power	potencia
factors and multiples	factores y múltiplos
common factors	factores comunes
working with factors	trabajo con factores
numbers with only two factors	números con sólo dos factores
prime numbers	números primos
prime factors	números primos como factores
product of prime factors	producto de factores primos
factor tree	árbol de factores
exponents	exponentes
nth power	poder de n
factors	factores
product	producto
missing factors	factores faltantes
common factor property	propiedad del factor común
common factor rule	regla de factor común

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geometric shapes	figuras geométricas
geometry	geometría
points	puntos
curves	curvas
lines	rectas
rays	rayos
line segment	segmento de recta
intersection	intersección
measuring line segments	medición segmentos de recta
planes	planos
angle	ángulo
vertex	vértice
sides	lados
surface	superficie
closed curves	curvas cerradas
simple closed curves	curvas cerradas simples
angles	ángulos
right angles	ángulos rectos
area	área
parallel	paralela
triangle	triángulo
rectangle	rectángulo
square	cuadro
diagonal	diagonal

line	línea
pyramid	pirámide
faces	caras
edges	aristas, lados
vertices	vértices
perimeter	perímetro
cube	cubo
cylinders	cilindros
bases	bases
height	altura
cones	conos
sphere	esferas
ellipses	elipses
pentagon	pentágono
hexagon	exágono
quadrilaterals	cuadrilateros
length	longitud
polygon	polígono
circumference	circunferencia
congruents	congruentes
protractor	cartabón
diameter	diámetro
circle	círculo
region	región
circular region	región circular
tetrahedron	tetraedro
polyhedron	poliedro
symmetry	simetría
symmetrical	simétrico
square region	regioñ cuadrada
standard unit	unidad normal
cubic	cúbica
geometry and graphing	geometría y gráficas
planes	planos
intersecting planes	intersección de planos
parallel planes	planos paralelos
space figures	figuras en el espacio

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congruent figures	figuras congruentes
closed curves	curvas cerradas
simple curves	curvas simples
recognizing geometric shapes	identificación de figuras geométricas
interior and exterior of curves	interior y exterior de curvas
regions	regiones
diameter	diámetro
rectangular prism	prisma rectangular
triangular prism	prisma triangular
sides	caras o lados
area	área
degree	grado
straight angle	ángulos rectos

perpendiculars	perpendiculares
triangle	triángulo
rectangle	rectángulo
parallelogram	paralelogramo
square	cuadrado
center	centro
radius	un radio
distance around	longitud del contorno
point	punto
unit of length	unidad estandar de longitud
unit of area	unidad estandar de área
square inches	pulgadas cuadradas
volume	volumen
cubic inches	pulgadas cúbicas
second axis	segundo eje
first axis	primer eje

NUMBER SYSTEMS

Level:

Grades 7 - 12

Objectives:

The student will do orally and in written form simple mathematical manipulations employing the Roman and Mayan number systems.

Rationale:

For the Mexican and Mexican-American student, the presentation of the Mayan number system as only one element of a very complex civilization will be a relevant cultural experience.

Level of Communication:

Large group or individual student

Procedure:

Both the English and the Spanish versions of the handout may be used if necessary. (See following pages.)

1. First, if the situation is appropriate, elicit from the students their knowledge or impressions about number systems and about the Maya culture.

2. In a teacher-to-student or a student-to-student structure, ask direct questions from the discussion and the printed introduction.

   Where did the Mayas live?

   When did the Mayas live?

   What kind of number system do we use?

   What are observatories?

   How did the system of Roman numerals develop?

3. Drill and review the vocabulary through repetition.

4. Student will demonstrate the hand movements which designate the Roman numerals. This may be done as repetition drills with the teacher or as oral problems. For instance: How do we demonstrate

the number *11* in Roman numerals? Show both hands crossed; then show one finger.

5. Drill with the following activities to show the Mayan number system:

<u>How many...? There are.... transformation drills</u>

Teacher: How many dots are in number 4?

Student: There are four dots in number 4.

Teacher: How many bars are in number 15?

Student: There are three bars in number 15.

<u>Statement-to-Question transformation</u>

Teacher: There are 2 bars in number 10.

Student: Are there 2 bars in number 10?

Teacher: There are 7,200 days in 1 katun.

Student: Are there 7,200 days in 1 katun?

Teacher: There is one line and one dot in number 6.

Student: Is there one line and one dot in number 6.

Teacher: The Mayas use the shell symbol for 0.

Student: Do the Mayas use the shell symbol for 0?

Teacher: Twenty kins equal one uinal.

Student: Do twenty kins equal one uinal?

Teacher: Eighteen uinals equal one tun.

Student: Do eighteen uinals equal one tun?

<u>Indirect Questioning</u>

Teacher: Raúl, ask José if there are 360 days in 1 tun.

Raúl: José, are there 360 days in 1 tun?

José: Yes, there are 360 days in 1 tun.

Teacher: María, ask Porfirio how many bars are in number 15.

María: Porfirio, how many bars are in number 15?

Porfirio: There are 3 bars in the number 15.

Teacher: Ask me how many dots are in number 6, etc.

6. Student will answer orally problems using the Maya numerals. Write the symbols on the chalkboard or on the overhead projector. Adding, subtracting, multiplying, and dividing manipulations can be incorporated. Keep the answers within the limitations of 19.

7. Review pronunciation in English of the hundreds, thousands, millions, and billions. Students will read aloud the numbers written on the chalkboard (in groups and individually). Students will write the numbers from dictation.

Example: Extract numbers found in the divisions of the Maya calendar.

360	144,000	23,040,000,000
785	1,152,000,000	
7,200	2,565,324	

8. Compare the Maya calendar to ours. What are the similarities and differences between the two calendars?

day	year	millennium
week	decade	
month	century	
kins	tuns	
uinals	katuns	

(see the How many...? There are.... transformation in No. 5)

Arabic Number System:

Our system, called the Arabic, uses the 0 and a base of 10.

Roman Number System:

We also use the Roman numerals. Following are these numerals from 1 through 19:

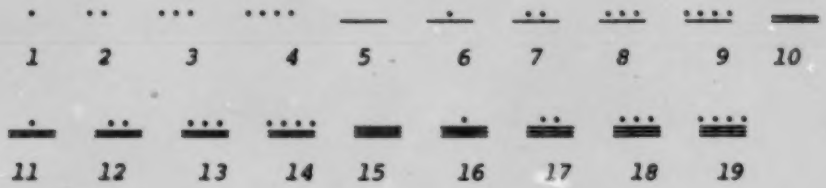
I II III IV V VI VII VIII IX X

XI XII XIII XIV XV XVI XVII XVIII XIX

Mayan Number System:

The Mayas lived in Mexico many centuries ago, long before the Spanish arrived there. The Mayas lived in a very advanced civilization. They had farms and beautiful buildings and even observatories for viewing the heavens and the movements of the stars. The Mayas developed a number system very different from the Arabic and Roman systems we use today.

The Mayas used two ways of writing numbers. One of the ways is with bar-and-dot numerals. These are the Mayan numerals 1 through 19:



1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19

The periods of the Mayan calendar were counted like this:

20 kins	=	1 uinal or 20 days
18 uinals	=	1 tun or 360 days
20 tuns	=	1 katun or 7,200 days
20 katuns	=	1 baktun or 144,000 days
20 baktuns	=	1 pictun or 2,800,000 days
20 pictuns	=	1 calabtun or 57,600,000 days
20 calabtuns	=	1 kinchiltun or 1,152,000,000 days
20 kinchiltuns	=	1 alautun or 23,040,000,000 days.

The Mayas used these large divisions of time in their religion. They talked about the past and they predicted the future.

El Sistema Numeral de los Árabes:

Nuestro sistema numeral, que llamamos *árabe* usa el 0 (cero) y una base de 10 (diez).

El Sistema Numeral de los Romanos:

Nosotros también usamos los numerales *romanos*. Los siguientes son los numerales *romanos* desde uno al diez y nueve:

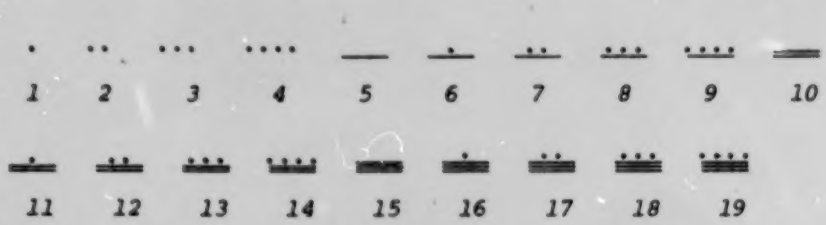
I II III IV V VI VII VIII IX X

XI XII XIII XIV XV XVI XVII XVIII XIX

El Sistema Numeral de los Mayas:

Los mayas vivieron en México hace muchos siglos. Vivieron dentro de una civilización muy avanzada. Tuvieron fincas, edificios y también tuvieron observatorios para ver los cielos y el movimiento de las estrellas. Los mayas organizaron un sistema numeral muy diferente al que hoy usamos.

Los mayas usaban dos métodos para escribir sus números. Un método fue con el uso de barras (——) y puntos (···). Los siguientes son los números mayas desde uno al diez y nueve:



1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19

El segundo método fue el que usaban para contar el tiempo en su calendario.

20 kins	=	1 uinal o 20 días
18 uinals	=	1 tun o 360 días
20 tuns	=	1 katun o 7,200 días
20 katuns	=	1 baktun o 144,000 días
20 baktuns	=	1 pictun o 2,800,000 días
20 pictuns	=	1 calabtun o 57,600,000 días
20 calabtun	=	1 kinchiltun o 1,152,000,000 días
20 kinchiltun	=	1 alautun o 23,040,000,000 días

Los mayas usaban estas grandes divisiones de tiempo en su religión. Hablaban del pasado y predicaban el futuro.

CONSUMER MATH

Level:

Grades 7 - 9

Objectives:

1. The student will be able to read the grocery ad fliers, specifically noting:
   a. abbreviations used for different items
   b. prices and number of items for a particular price
   c. different departments in a grocery store and how items are categorized
2. The student will be able to compare prices of items and compute the cost of an item.
3. The student will be able to compute the cost of a given grocery list.

Level of Communication:

Large or small group

Procedure:

1. Hand out fliers, one to each student.
2. Have the student locate the following information on his flier:
   a. What store is advertising the specials?
   b. Where is the store (address)?
   c. On what dates will the specials be in effect?
3. Write on the chalkboard a list of abbreviations used in the flier.

Examples:	lb	doz	w/c (with coupon)
	gal	pt	qt
	pkg	ctn	

Repetition Drill: Have student repeat the abbreviation. The teacher may have to translate words to Spanish for clarification.

Teacher	Student
lb pound	lb pound
gal gallon	gal gallon

Recognition Drill:

Teacher	Student
What is sold in cartons?	Any correct response using the flier
What is sold in bottles?	
What is sold in pounds?	
What is sold in gallons?	

4. Write on the chalkboard a list of different departments found in a grocery store.

Examples:

meat	drug
produce	dairy products
frozen foods	household and cleaning

Repetition Drill: Have student repeat names of departments. This can be done in groups, individually by rows, etc.

Teacher	Student
meat	meat
produce	produce
dairy products	dairy products

Recognition Drill: Have student give examples of items found in each department.

Teacher	Student
María, name an item from the produce department.	Any correct response
José, what can we find in the dairy department?	Any correct response

5. Show students how to determine cost of items by providing different models and illustrations:

Examples: 3 lbs of finger ribs @ 65 ¢ per lb

.65 - price per lb
X 3 - number of pounds
1.95 = cost for 3 pounds

- -

4 cans of corn @ 35 ¢ per 2 cans

4 ÷ 2 = 2 units .35 - price for 2 cans
X 2 - number of units
.70 = cost for 4 cans

- -

12 bottles of Pepsi Cola @ 65 ¢ per carton of 6 bottles

12 ÷ 6 = 2 cartons

.65 - price for 6 bottles
X 2 - number of cartons
1.30 = cost for 12 bottles or 2 cartons

- -

Evaluation:

Give students problems testing different objectives as stated on first page.

Materials:

Fliers or mimeographed sheets of grocery specials

Suggestions:

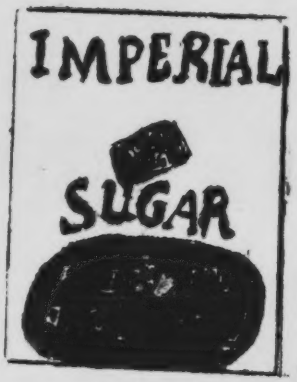
There are many similar activities useful in teaching budgeting and shopping skills. The Sears, Penneys, or Spiegel catalogs would be good resource materials. Also, any supply catalogs would be appropriat

PIGGLY WIGGLY

SAVE

Foodtown

JUNE 20 & 22



5 Pound Bag $1.45

Swift's "Premium" BACON (Thick-Sliced) 2lb. Pkg ..$1.69

Dr Pepper

King Size Crtn. of 6... 65¢

(Plus Deposit)

White Wing Flour

25 LB. BAG 4.19

TALL cans 2 for 53¢

Use the flier showing the week's specials to find the cost of each day's groceries, as listed below:

MONDAY		TUESDAY	
2 lbs chorizo	_____	12 Cola drinks	_____
2 doz eggs (Grade "A" Large)	_____	2 lbs hamburger	_____
1 gal milk	_____	2 lbs tomatoes	_____
6 tubes biscuits	_____	1 head lettuce	_____
2 lbs coffee	_____	4 cans corn	_____
TOTAL	_____	TOTAL	_____

WEDNESDAY		THURSDAY	
2 boxes laundry detergent	_____	10 lbs menudo	_____
6 bars bath soap	_____	25 lbs flour	_____
1 tube toothpaste	_____	5 lbs sugar	_____
2 bottles shampoo	_____	1 gal ice cream	_____
		3 lbs shortening	_____
TOTAL	_____	TOTAL	_____

Abbreviations

lbs - pounds	doz - dozen	w/c - with coupon
gal - gallon	pt - pint	qt - quart
pkg - package	oz - ounce	ctn - carton

Grocery Departments

Meat	Produce	Frozen Foods	Drug	Dairy Products	Household & Cleaning

(Write a list of items on chalkboard; students will write them under appropriate department name)

FRACTIONS

Introducing Fractions

Level:

Grades 7 - 9

Objectives:

1. The student will be able to read the different fractions and, specifically, to pronounce the denominators.

2. The student will be able to add fractions.

Level of Communication:

Small or large group

Procedure:

1. The teacher will write the following fractions on the chalkboard:

   1/10 2/10 3/10 4/10 5/10 6/10 7/10 8/10 9/10 10/10

   Repetition Drill: Teacher says fraction; students repeat.

Teacher	Student
1/10 (one tenth)	1/10
2/10 (two tenths)	2/10

   Substitution Drill: The student substitutes the different numbers for the numerator and says complete fraction.

Teacher	Student
2	2/10
3	3/10
4	4/10
5	5/10
6	6/10
7	7/10
8	8/10
9	9/10
10	10/10

Repetition: The same procedure is used to give students practice in pronouncing the different denominations.

ninths	1/9	2/9	3/9	4/9	5/9	6/9	7/9	8/9	9/9
eighths	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	
sevenths	1/7	2/7	3/7	4/7	5/7	6/7	7/7		
sixths	1/6	2/6	3/6	4/6	5/6	6/6			
fifths	1/5	2/5	3/5	4/5	5/5				
fourths	1/4	2/4	3/4	4/4					
thirds	1/3	2/3	3/3						
halves	1/2	2/2							

2. After the group can pronounce the fractions correctly, the addition operation is explained, beginning with fractions that have the same denominators and then adding fractions with different denominators.

Common denominators	1/3 + 2/3
	2/4 + 1/4
Unlike denominators	2/7 + 1/2
	5/8 + 3/4
	4/9 + 2/3

Have the students go to the chalkboard in groups. Give each a different problem to work. Students can be spot checked here. (They should practice reading the expressions aloud.)

Additional Procedures:

Reinforcement of recognition of fractions may be accomplished through directed writing activities leading to expansion to alternate expressions.

Example: Write fractions on the chalkboard: 1/2, 1/3, 1/5, 1/4

Substitution Drill:

Teacher says:	Student writes:
I ate one-half of the pie.	I ate one-half of the pie.
half	half
I ate half of the pie.	I ate half of the pie.

Teacher says:	Student writes:
I saw one-third of the movie.	I saw one-third of the movie.
a third	a third
I saw a third of the movie.	I saw a third of the movie.
He read one-fifth of the book.	He read one-fifth of the book.
a fifth	a fifth
He read a fifth of the book.	He read a fifth of the book.

Example: The students will listen carefully as the teacher reads the following passage (or another appropriate narrative including expressions of fractions).

A Party

> Last Saturday, I went to a quinceañera celebration. My cousin went with me. We drove for half an hour. The whole family was there. I spent a third of the time talking and the rest of the time dancing. The cake was very large. I must have eaten a fourth of it!

The reading should be repeated at least three times. Then, using the clues written on the chalkboard, the students will rewrite the narrative, using the following key words:

Sentence 1 -	Saturday		went		celebration
2 -	cousin		me		
3 -	We		drove		half
4 -	whole		family		there
5 -	spent	third	talking	rest	dancing
6 -	cake		large		
7 -	I	must have eaten			fourth

Having completed the listening and writing activities, students will read the results to the class.

Addition of Fractions - Word Problems

Level:

Grades 7 - 9

Objectives:

1. The student will be able to read orally the given math word problems and give a written response in a correct and complete sentence.

2. The student will be able to add the specified fractions to solve each problem.

Level of Communication:

Group

Procedure:

The teacher copies the word problems on the chalkboard.

Example: María cooked 1/2 of the calabaza with chicken and 1/3 of it with pork. How much of the calabaza did she use?

Repetition Drills: The teacher reads the word problem one part at a time and the student models after teacher, or the teacher can use the backward build-up method.

Teacher	Student
María cooked 1/2 of the calabaza with chicken	María cooked 1/2 of the calabaza with chicken
and 1/3 of it with pork.	and 1/3 of it with pork.

Backward Build-up

with pork.	with pork.
and 1/3 of it with pork.	and 1/3 of it with pork.
with chicken and 1/3 of it with pork.	with chicken and 1/3 of it with pork.
1/2 of the calabaza with chicken and 1/3 of it with pork.	1/2 of the calabaza with chicken and 1/3 of it with pork.

María cooked 1/2 of the calabaza with chicken and 1/3 of it with pork.

María cooked 1/2 of the calabaza with chicken and 1/3 of it with pork.

Computation Drill: Show students how to set up the problem by providing a model.

Example:
$$\begin{array}{l} 1/2 \text{ of the calabaza with chicken} \\ \underline{1/3 \text{ of the calabaza with pork}} \\ ? \end{array}$$

Then show students how to determine solution.

Example:
$$\begin{array}{rl} 1/2 & = 3/6 \\ \underline{1/3} & \underline{= 2/6} \\ & 5/6 \end{array}$$

Transformation Drill: After determining math solutions, have students write a complete and correct sentence to answer math problem. Have students practice saying correct sentence pattern.

Teacher	Student
How much of the calabaza did María use?	María used 5/6 of the calabaza.

Evaluation:

Give students some word problems to work on their own.

1. Juan ran 1/5 mile, rested, and then ran 3/5 mile. How far did he run?
2. María cooked 1/2 of the calabaza with chicken and 1/3 of it with pork. How much of the calabaza did she use?
3. The girls ate 1/4 of the birthday cake while the boys ate 1/2 of it. How much cake was eaten?
4. Four-sevenths of the boys in the class are Mexican-American while only 1/3 of the girls are. What part of the class is Mexican-American?
5. Efraín spent 1/4 of his check on the rent and 1/6 of it on utility bills. How much of his check did he spend on rent and bills?

Check the problems for the following:

1. problem set up
2. math solution
3. sentence response

Additional Activities:

When giving students word problems, make material more relevant and/or more interesting by writing about things that are familiar to them or that they may have some experience with or just by changing names to match those in the class.

Another activity that can be used with fractions is to have students double or halve given Mexican recipes.

Multiplication of Fractions

Level:

Grades 7 - 9

Objectives:

1. The student will be able to state how to find the product of two fractions.

2. The student will be able to name the product of two fractions.

Level of Communication:

Individuals or group

Procedure:

1. The teacher hands out copies of the exercise sheet to all students. (Cardboard models may be made of all figures in No. 1 of the exercises. The different parts separated show that they are equal.)

2. Explain the different parts to the students. Have them do exercise No. 1. They may do this as a group or you may call on them individually.

3. Write the rule on the chalkboard. Have the students go over the rule carefully. Explain by giving examples.

   Cuando se multiplican las fracciones, multiplicar los numeradores para saber el numerador del producto y multiplicar los denominadores para saber el denominador del producto.

4. After giving a few examples on chalkboard, ask the students the following questions on multiplication of fractions.

   1. Nombre el denominador.
   2. Nombre el numerador.
   3. ¿Cuál es el producto de los numeradores?
   4. ¿Cuál es el producto de los denominadores?

Repetition Drills: The teacher writes the problem on the chalkboard and as she points to various parts of the problem she has the students name the parts.

2/3	x	1/2	=	2/6
(a)		(b)		(c)

Teacher points to the "2" in (a). Students say "numerator"
Teacher points to the "3" in (a). Students say "denominator"

Teacher does the same with the numerator and denominator in (b).

Teacher points to "2" in (a) and "1" in (b).	Students say "numerators"
Teacher points to "3" in (a) and "2" in (b).	Students say "denominators"
Teacher points to "2/6" in (c).	Students say "product"
Teacher points to "2" in (c).	Students say "product of numerators"
Teacher points to "6" in (c).	Students say "product of denominators"

Teacher points to "x" (times) and "=" (equal to)

Students say "2 times 1 is equal to 2" and
"3 times 2 is equal to 6"

Note: All of the above repetition drills may be done as often as necessary. You may want to call on individuals or call on groups. Check how well they have learned the pronunciation and meaning by pointing to the numbers as rapidly as possible. Have the students answer at random.

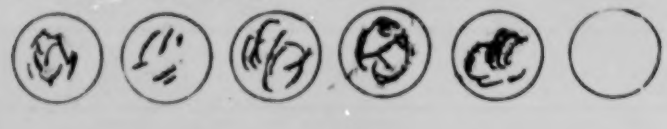
Ejercicios

1. Escriba una fracción indicando que parte de la figura está más obscura.

(a) (b) (c) (d) (e)

____ ____ ____ ____ ____

2. En la familia de Gloria y Juanita hay 6 personas. Todas las mañanas, Juanita y Gloria lavan 3 platos cada una después del almuerzo. Esta mañana, Juanita se levantó tarde. Cuando llegó Juanita, ¿qué parte de los platos había lavado Gloria?



____

3. ¿Cuantos son 2/5 de 1/3? Estudie las figuras.

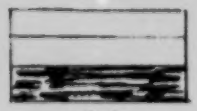
En (a), 1/3 de la figura está más obscura.

En (b), 2/5 de la parte obscura está marcada de cruces.

Tome nota qué hay 15 partes separadas en (b). ¿Qué fracción indica cuanto de la figura está marcada de cruces?

2/5 de 1/3 = ?/15

1/3



(a)

2/5 de 1/3

(b)

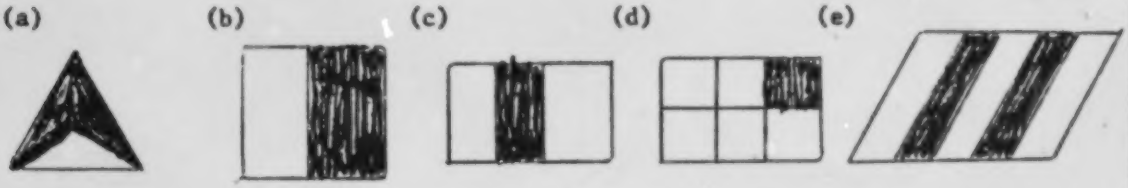
4. Multiplicar

1/2 x 1/4 =
2/7 x 3/5 =
1/3 x 1/2 =
3/10 x 8/6 =
3/8 x 5/9 =

Exercises

1. Write the fraction indicated by the shaded areas of the figures.

(a) (b) (c) (d) (e)



____ ____ ____ ____ ____

2. There are six people in the family of Gloria and Juanita. Every morning, after breakfast, Juanita and Gloria each wash three plates. This morning, Juanita slept late. When Juanita came in, what fractional part of the plates had Gloria washed?

____

3. How much is 2/5 of 1/3? Study the figures.

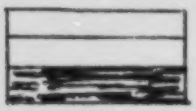
In (a), 1/3 of the figure is shaded.

In (b), 2/5 of the shaded area is crosshatched.

Note that there are 15 separate parts in (b). What fraction indicates how much of the figure is crosshatched?

2/5 of 1/3 = ?/15

1/3



(a)

2/5 de 1/3

(b)

4. Multiply:

1/2 x 1/4 =
2/7 x 3/5 =
1/3 x 1/2 =
3/10 x 8/6 =
3/8 x 5/9 =

Division of Fractions

Level:

Grades 7 - 12

Objectives:

The student will be able to divide fractions by using three different methods: (1) Long Method, (2) Cancellation, and (3) Zig-zag.

Level of Communication:

Large group

Procedure:

1. The teacher shows Visual A to the class. Problem 4/6 ÷ 1/3. The teacher divides the cherry pie into six equal parts and labels each part 1/6. The lemon pie is divided into 1/3's and labeled. (See Visual A-1.) Using these visuals, the teacher shows the class that the solution to the problem is "2." Then the teacher explains how to divide fractions: the divisor is inverted and then the two fractions are multiplied (See Visual B.)

   Example: $4/6 \div 1/3$

   $4/6 \times 3/1 = 12/6 = 2$

2. The above procedure illustrates the long method of dividing fractions. The second method is the cancellation method. Cancellation is done after the divisor is inverted and the sign changed. (See Visual B.)

   Example: $4/6 \div 1/3$

   $4/6 \times 3/1$

   $\overset{2}{\cancel{4}}/\cancel{6} \times \cancel{3}^{1}/1 = 4/2 = 2$

3. The third way to divide is the zig-zag method (See Visual C.) The numerator of the fraction on the left is multiplied by the denominator of the fraction on the right to get the numerator of the solution. The denominator of the solution is the denominator of the fraction on the left multiplied with the numerator of the fraction on the right.

   $4/6 \div 1/3 = 12/- = 12/6 = 2$

   $4/6 \div 1/3 = -/6$

Repetition Drills: Oral drills can include repetition of the rules for division of fractions. For example, "To divide fractions, invert the divisor and multiply the numerators by each other and then multiply the denominators by each other."

Evaluation: Use the following exercises for evaluation.

NAME THE RECIPROCAL:

(1) $\frac{1}{3}$ (3) 3 (5) $\frac{3}{8}$ (7) 100 (9) $\frac{3}{4}$

(2) $\frac{2}{3}$ (4) $\frac{1}{2}$ (6) $\frac{6}{5}$ (8) $\frac{1}{10}$ (10) $\frac{4}{3}$

DIVIDE: LEAVE ALL ANSWERS IN SIMPLEST FORM.

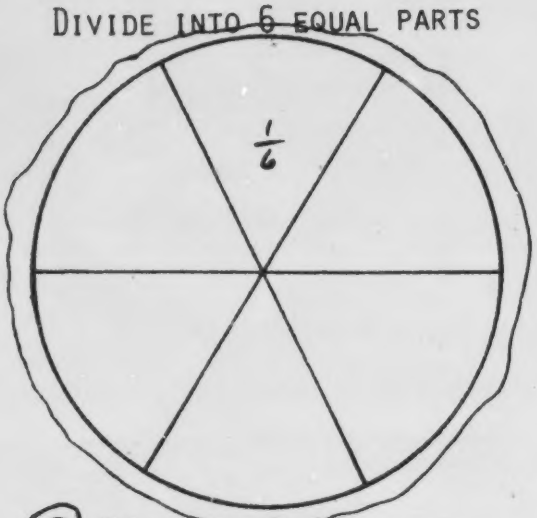
(11) $\frac{3}{4} \div \frac{2}{3}$ (14) $\frac{7}{16} \div \frac{1}{2}$ (17) $\frac{5}{8} \div \frac{3}{16}$

(12) $\frac{1}{6} \div \frac{7}{8}$ (15) $\frac{3}{8} \div \frac{3}{5}$ (18) $\frac{3}{16} \div \frac{9}{32}$

(13) $\frac{2}{5} \div \frac{1}{4}$ (16) $\frac{3}{10} \div \frac{9}{20}$ (19) $\frac{1}{8} \div \frac{2}{3}$

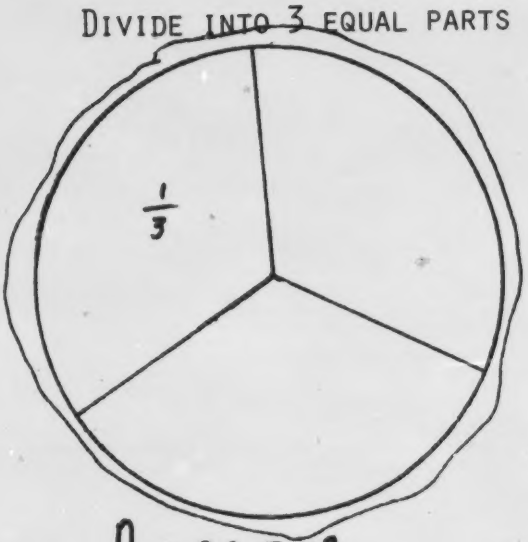
VISUAL A-1

DIVIDE INTO 6 EQUAL PARTS



CHERRY

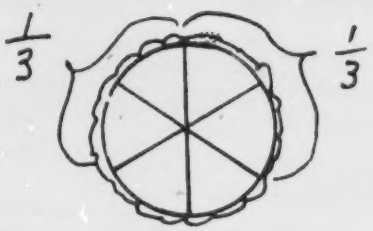
DIVIDE INTO 3 EQUAL PARTS



LEMON

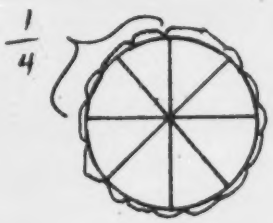
VISUAL A-2

(1)



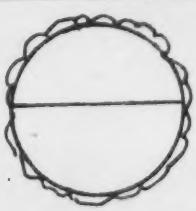
$$\frac{4}{6} \div \frac{1}{3} = \frac{4}{6} \times \frac{3}{1} = \frac{12}{6} = 2$$

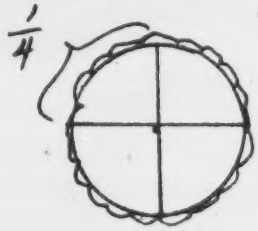
(2)



$$\frac{4}{8} \div \frac{1}{4} = \frac{4}{8} \times \frac{4}{1} = \frac{16}{8} = 2$$

(3)





$$\frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = \frac{4}{2} = 2$$

VISUAL B

PROBLEM (LONG WAY)

$$\frac{4}{6} \div \frac{1}{3}$$

$$\frac{4}{6} \times \frac{3}{1} = \frac{12}{6} = 2$$

PROBLEM (CANCELLATION)

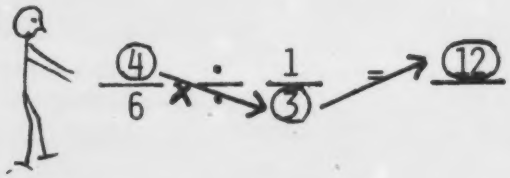
$$\frac{4}{6} \div \frac{1}{3}$$

$$\frac{4}{\cancel{6}_{2}} \times \frac{\cancel{3}^{1}}{1} = \frac{4}{2} = 2$$

VISUAL C

PROBLEM (ZIG-ZAG)

$$\frac{4}{6} \div \frac{1}{3}$$



$$\frac{\cancel{4}^{2}}{\cancel{6}_{3}} \div \frac{1}{\cancel{3}_{1}} = \frac{12}{6} = 2$$

DECIMALS

Introducing Decimals

Level:

Grades 7 - 9

Objective:

After learning to add, subtract, multiply, and divide fractions, the students will be able to change to decimals those fractions whose denominators are 10, 100, and 1,000.

Level of Communication:

Large group

Procedure:

1. Drill orally the terminology necessary for this lesson:

   tenths
   hundredths
   thousandths
   decimal point

   (Spanish-speaking students will have some difficulty with the "th" sound.)

2. Pass out the exercise sheet.

3. Do introduction orally and write it on the chalkboard. (The introduction is written in both languages.)

4. Explain decimal point using numerous examples.

5. Have students write the solutions to the problems.

6. Have the correct solutions written on the chalkboard.

Evaluation:

Use the attached Exercise Sheet.

Exercises:

Introduction: A mixed number such as 3-4/10 can be written as 3.4. Any fraction whose denominator is 10, 100, or 1000 may be written in decimal form.

Un número mezclado como 3-4/10 se puede escribir 3.4. Cualquiera fracción que tenga un denominador de 10, 100, o 1000 se puede escribir en decimales.

1. Add the following fractions: Sume las siguientes fracciones:

   4/10 + 3/10 = 7/10 3/1 + 3/10 = 33/10

   4/10 + 3/100 = 43/100 2/100 + 4/100 = 6/100

2. Now write the answers in decimal form.

   Escriba los productos en el ejercicio número uno en forma decimal.

   4/10 + 3/10 = 7/10 (____) 3/1 + 3/10 = 33/10 (____)

   4/10 + 3/100 = 43/100 (____) 2/100 + 4/100 = 6/100 (____)

3. Complete the following: Completar los siguientes:

   .2 , 2 tenths, 2/_____ .2, 2 décimos, 2/_____

   _____, 2 hundredths, 2/100 _____, 2 centésimos, 2/100

   .002, 2 thousandths, 2/_____ .002, 2 milésimos 2/_____

   2.3 Two and _____ tenths. 2.3 Dos y _____ décimos

   13.8 Thirteen and eight _____. 13.8 Trece y ocho _____.

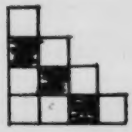
   .1 One _____. .1 Un _____.

   .123 One hundred twenty-three _____. .123 Ciento veinte y tres _____.

4. Write fractions and decimals to tell the part of the figure that is shaded.

   Escriba fracciones y decimales para indicar las partes de la figura que están obscuros.

(____) (____)



(____) (____)

(____) (____)

Addition and Subtraction of Decimals

Level:

Grades 7 - 9

Objectives:

1. The student will be able to set up the given decimals in column form for each operation.

2. The student will be able to add or subtract decimals correctly in each exercise.

Level of Communication:

Group

Procedure:

1. Teacher writes some decimal problems on the board using the addition operation and, also, the subtraction operation, such as:

.6 + .5 =	.6 - .5 =
1.2 + .7 =	1.2 - .7 =
3.4 + .34 =	3.4 - .34 =

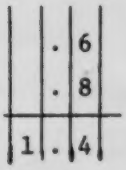
2. Teacher reads the decimal problems and the students repeat. This can be used as a warm-up exercise.

Teacher	Student
.6 + .5 (point six plus point five)	point six plus point five
1.2 + .7 (one point two plus point seven)	one point two plus point seven
3.4 + .34(three point four plus point thirty-four)	three point four plus point thirty-four
Similarly	
.6 - .5 (point six minus point five)	point six minus point five
1.2 - .7 (one point two minus point seven)	one point two minus point seven
3.4 - .34(three point four minus point thirty-four)	three point four minus point thirty-four

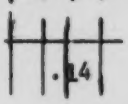
3. Problem set-up and computation. Show students how to set up decimals in column form and how to compute the operation. The same rules apply for addition and subtraction.

Decimal points should line up beneath one another in same column.

.6 + .8



Digits should line up in column and in proper place; tenths under tenths, hundredths under hundredths.



correct

There should be only one digit per column.

incorrect

Zeros may be filled in to help stay within a column.

3.4 + .34

3 .40
0 .34
---
3 .74

correct

4. Board practice. Students should go to the chalkboard to work some decimal problems for practice and to help teacher spot check any problem areas. Teacher should check for points mentioned on previous page.

Evaluation:

Attached worksheet

WORKSHEET

ADDITION AND SUBTRACTION OF DECIMALS

Write these in column form; then add

1. .6 + .8
2. .7 + .4 + .3
3. 5 + .5 + .05
4. 2.1 + 2.0 + .21
5. .001 + .999

Write these in column form; then subtract

1. 3.98 - 1.47
2. .2 - .17
3. 1 - .999
4. .5 - .49
5. 10 - 2.83

17

Multiplication of Decimals

Level:

Grades 7 - 8

Objective:

Students will be able to multiply decimals with one, two, and three decimal places.

Level of Communication:

Large group or individuals

Procedure:

1. Students will refer to newspapers to find numbers with decimals. They will avoid concentrating entirely on decimals regarding money.

2. Students will explain what they think the decimals mean.

3. As a warm-up exercise, students will respond orally to repetition and to substitution exercises, drilling and reinforcing pronunciation and recognition of fractions, numbers, points, etc. Teacher will emphasize the pronunciation of the final th as in tenth, since the Spanish-speaking student frequently has difficulty with that sound.

4. Students will work problems on the chalkboard with guidance from the teacher.

5. Students will work individually on written exercises to demonstrate their mastery of the manipulation.

6. Students will orally complete Set b which should have the same numbers as Set a.

   a. (8/10), (9/10), (10/10), (1-3/10), (14/100), (15/100), (16/100), (17/100)

   b. (.8), ( ), ( ), (1.3), (.14), ( ), ( ), ( )

7. Teacher will explain points when changing from fractions to decimals and demonstrate by putting the work on the chalkboard, saying the problems and having the students repeat what she has said.

	Teacher	Student
	.8 (point 8) in Set b is equal to 8/10 in Set a.	.8 in Set b is equal to 8/10 in Set a.
or	Is .8 in Set b equal to 8/10 in Set a?	Yes, .8 in Set b is equal to 8/10 in Set a.

Is .9 in Set b equal to 9/10 in Set a?	Yes, .9 in Set b is equal to 9/10 in Set a.
What is 8/10 in Set a equal to in Set b?	8/10 in Set a is equal to .8 in Set b.
What is 9/10 in Set a equal to in Set b?	9/10 in Set a is equal to .9 in Set b.

Continue reinforcing the concept until most of the students respond readily.

8. Teacher will personalize the concept through word problems:

Juan owes María $0.65. Juan gives María three quarters. Now, how much does María owe Juan?

Juan le debe a María $0.65. Juan le da tres pesetas a María. Ahora, ¿cuánto le debe María a Juan?

$$\begin{array}{r} .25 \\ .25 \\ .25 \\ \hline .75 \end{array} \qquad \begin{array}{r} .75 \\ -.65 \\ \hline .10 \end{array}$$

Maria owes Juan $0.10.

Le debe a él $0.10.

(Visual aids will help reinforce word problem representations.)

9. The multiplication of decimals is similar to the multiplication of fractions. The teacher may use the following to explain and illustrate multiplication of decimals.

La multiplicación de decimales se acerca a la multiplicación de fracciones.

$4 \times 2/10 = 4/1 \times 2/10 = 8/10$ o $4 \times .2 = .8$

$2/10 \times 2/10 = 4/100$ o $.2 \times .2 = .04$

$2/10 \times 3/100 = 6/1000$ o $.2 \times .03 = .006$

Show the decimal point in the product of each problem.

Indique el punto decimal en el producto de cada problema.

$$\begin{array}{r} 1.5 \\ \times .13 \\ \hline \end{array} \qquad \begin{array}{r} 1.5 \\ \times 1.3 \\ \hline \end{array} \qquad \begin{array}{r} 2.1 \\ \times .34 \\ \hline \end{array} \qquad \begin{array}{r} 1.8 \\ \times .12 \\ \hline \end{array}$$

Evaluation:

Attached worksheet

WORKSHEET

MULTIPLYING DECIMALS

Multiply the following:

1. .5 x 14 =
2. .25 x 100 =
3. 2 x .5 =
4. .125 x 8 =
5. .7 x .2 =
6. .8 x 3 =
7. 2.2 x 2 =
8. 44.4 x .02 =
9. .9 x .5 =
10. 7.25 x 200 =
11. 12.2 x .12 =
12. 33 x .2 = _____ (66, 6.6, .66, .066)
13. 1.11 x 4 = _____ (444, 44.4, 4.44, .444)
14. 4 x 2.5 = _____ (1, 10, 100, 1000)

POSITIVE AND NEGATIVE NUMBERS

Introducing Positive and Negative Numbers

Level:

Grades 7 - 9

Objective:

The student will be able to add and subtract positive and negative numbers.

Level of Communication:

Large or small group

Procedure:

1. To help the student understand the concept of positive and negative numbers, the teacher draws a number line on the chalkboard or gives each student a copy of Visual A. The signed numbers are called directed numbers (+ and -). The unsigned portion of a number is called the absolute value or the magnitude. Thus, +1 and -1 have the same magnitude, 1 ($|+1|=|-1|=1$).

2. The teacher then uses the thermometer (Visual B) as an example of directed numbers as well as magnitudes. The teacher then asks the students to compare the thermometer with the number line. (Note: The thermometer number line is vertical and finite; the mathematical number line is horizontal and infinite, as shown in Visual C.)

   A drawing representing levels above and below sea level will also provide visualization of the concept.

3. Prior to giving the students the addition problems, the teacher leads a repetition drill:

Teacher	Students
When adding like signs, add to get the sum.	Repeat
Negative 4 plus negative 3 is negative 7.	Repeat
Positive 4 plus positive 3 is positive 7.	Repeat

4. The teacher uses the number line to present the addition of unlike signs. Problem: $(-3) + (+4) = +1$. The teacher starts on the point indicating -3 on the number line. To add +4, the teacher counts right four places, stopping at +1, which is the solution. The teacher explains again, if necessary, and gives another example in the same way.

5. The teacher leads a repetition drill prior to giving the students the subtraction problems:

Teacher	Students
When adding numbers with different signs, take the difference in the magnitude.	Repeat
Assign the sign of the number with the largest magnitude.	Repeat
Negative 3 plus positive 4 is positive 1.	Repeat

6. The teacher again uses the number line to present the subtraction of signed numbers. Problems:

   (+8) - (+3) = +5

   (-6) - (-5) = -1

   (+6) - (-5) = +11

   The teacher will demonstrate through several examples that:

   To add means to move in the direction of the sign of the number of the larger magnitude.

   To subtract means to move in the opposite direction of the sign of the number being subtracted.

7. A repetition drill at this point will reinforce the understanding of subtraction of positive and negative numbers.

Teacher	Students
To subtract a signed number from another, change its sign and add.	Repeat
Positive 8 minus positive 3 is positive 5.	Repeat
Negative 6 minus negative 5 is negative 1.	Repeat
Positive 6 minus negative 5 is positive 11.	Repeat

Evaluation:

Exercise sheet

VISUAL A

NUMBER LINE

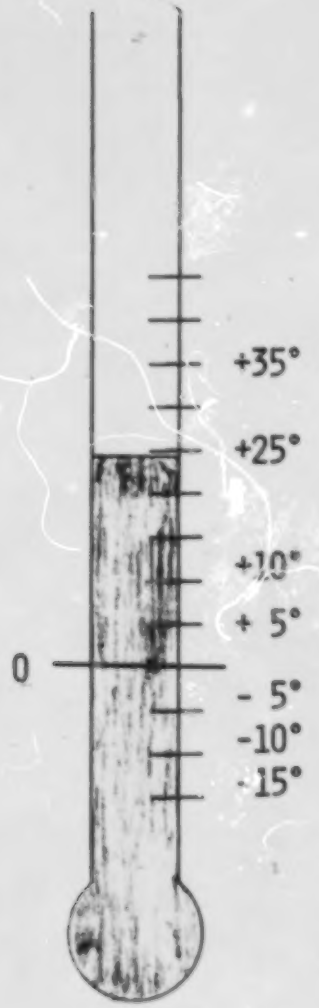
(+)

(—)

-9 -8 -7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7 +8 +9

VISUAL B

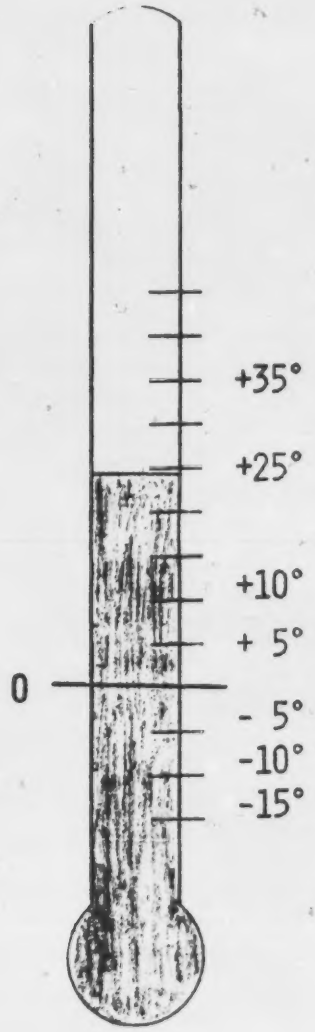
NUMBER LINE (THERMOMETER)



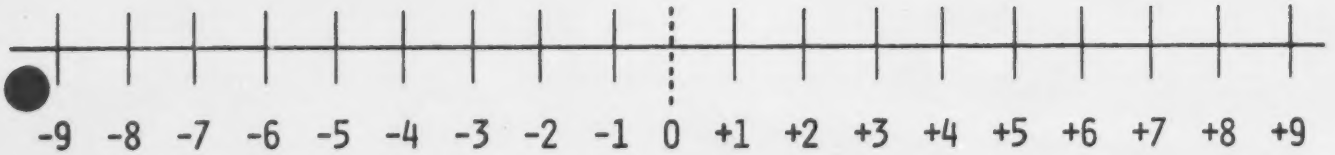
VISUAL C

THERMOMETER

VERTICAL NUMBER LINE



NUMBER LINE HORIZONTAL



EXERCISES

1. ADD

+19	+15	+13	+16	-19	-35
+14	+24	- 8	-25	+23	+28
-15	-12	+14	-18	-49	-33
-12	-15	-19	+23	-28	+15

2. ADD

+16 +2 +3 -5 -6

-7 +3 -4 +2 -3 +7 +1

+9 +2 +4 +6 -7 -3 -5

+3 -2 +1 -4 +5 -2 +1 -1 -3

+6 -6 +7 -7 +3 -3

-4 +7 +3 +5 -6 -2

+3 -4 -6 +5 +0

+15 - 12 +60 -5 -17 -30

+52 +13 -42 +12 -1 +49

0 -5 +1 -2 +3 -1 -2 +1 +0 +1 -3

SETS

Introducing Sets

Level:

Grades 7 - 9

Objectives:

1. The student will be able to identify the specified symbols.

{ }	Set
=	Equals
≠	Does not equal
∈	Is a member of
∉	Is not a member of
∅	Empty set

2. The student will be able to read the applied symbols and determine the solution set for each problem.

Level of Communication:

Small or large group

Procedure:

1. The teacher gives students handout listing the symbols being covered: { }, =, ≠, ∈, ∉, ∅. The symbols are listed with definitions in English and in Spanish. The teacher also copies symbols on chalkboard to introduce them to the students.

2. Bilingual application is optional. The teacher, if capable, may choose to explain the symbols in Spanish and give examples, or he may just give the Spanish term for each symbol. Either way, the student can relate the information more quickly and be able to apply it more easily.

Set	Un conjunto, un grupo de cosas. e.g., {1,2,3,4,5} el conjunto de números de uno a cinco.
Equal	Igual. e.g., (2/2 = 1) dos mitades es igual a uno.
Not equal	No es igual. e.g., (2 ≠ 4) dos no es igual a cuatro.
Is a member of	Es miembro de. e.g., 3 ∈ {1,2,3} tres es miembro del conjunto de números de uno a tres.

Repetition Drill: The teacher points to each symbol and identifies it. The students repeat the terms for the symbols.

Teacher	Students
Set	Set
Equal	Equal
Not equal to	Not equal to
Is a member of	Is a member of
Is not a member of	Is not a member of
Empty set	Empty set

Each identification may be repeated as often as necessary, depending on the class.

Application Drill: The teacher gives examples using all the symbols. The students then go to the chalkboard to list specified sets.

María, list the set of letters in your name.

{m,a,r,i,a}

Juan, list the set of even numbers from one to ten.

{2,4,6,8,10}

Enrique, list the empty set

{ ∅ }

Materials:

Handouts and poster boards with the symbols and translations of sets. Mimeographed exercises.

Evaluation:

Attached exercises

EXERCISES

Complete these sets.

1. Set of days in weekend
2. Set of numbers from 1 to 10
3. Empty set
4. Set of your three best friends

Given sets A and B answer the following questions with True or False.

A = {*, #, $, ¢, %}

B = {?, #, ¢, +, ≠}

1. Set A = Set B
2. Set B = ∅
3. # and ¢ ∈ of sets A and B
4. ≠ ∉ of set A
5. Set A = ∅
6. * ∈ Set A
7. ∅ = ∅

Fill in the blank with $\in$ or with $\notin$.

1. Red _____ { colors in rainbow }
2. 25 _____ { 4 x 5, 6 + 7, 21 + 4 }
3. 28 _____ { 20 + 8, 27 + 1 }
4. 10 _____ { a, b, c, d }
5. C _____ { 1, 2, 3, 4 }

Write the following sets, listing the elements

1. {the letters in the word "today"}
2. {the days of the week}
3. {all dogs that are cats}
4. {the letters in the word "ended"}
5. {the vowels in the word "mouth"}

{ }	SET
=	EQUALS
≠	DOES NOT EQUAL
∈	IS A MEMBER OF
∉	IS NOT A MEMBER OF
∅	EMPTY SET

{ }	EL CONJUNTO
=	IGUALAR
≠	NO ES IGUAL
∈	ES MIEMBRO DE
∉	NO ES MIEMBRO DE
∅	CONJUNTO VACIO

Union and Intersection of Sets

Level:

Grades 7 - 9

Objectives:

1. The student will be able to identify the union ($\cup$) and intersection ($\cap$) symbols in given sets and compute their operations.

2. The student will be able to list the elements of the union and/or intersection of two given sets.

Level of Communication:

Small or large group

Procedure:

1. The teacher writes the two symbols on the chalkboard with their definitions. Spanish definitions may be given for supplementary clarification.

$\cup$ =	union	unión
$\cap$ =	intersection	intersección

2. Repetition Drill - The teacher has the students repeat the names of the symbols and has them read some examples using the symbols.

Teacher points to	says	Students repeat
$\cup$	union	union
A $\cup$ B	the union of A and B	the union of A and B
A $\cup$ D	the union of A and D	the union of A and D
B $\cup$ K	the union of B and K	the union of B and K
$\cap$	intersection	intersection
A $\cap$ B	the intersection of A & B	the intersection of A & B
A $\cap$ D	the intersection of A & D	the intersection of A & D
B $\cap$ K	the intersection of B & K	the intersection of B & K

Do repetition exercises as often as necessary.

3. Application Drill - The teacher applies the symbols and performs the operation. Then the students go to chalkboard and work some practice exercises.

Examples:

Given: Set A = { 1, 2, 3, 4}

Set B = { 3, 4, 5, 6}

A $\cup$ B = {1, 2, 3, 4, 5, 6}

The union of two sets contains all those members that are in each set or that are in both sets.

La unión de dos conjuntos consiste en todos los elementos de cada conjunto, pero ningún elemento se debe apuntar más que una vez.

A $\cap$ B = {3, 4}

The intersection of two sets contains only those members that are common to both.

La intersección de dos conjuntos consiste en los elementos comunes a los dos.

Evaluation:

The attached exercises may be used for evaluation.

Exercises

Find the union $\cup$ of the following sets.

1. {1, 2, 3, 4} $\cup$ {5, 6, 7, 8}
2. {2, 4, 6, 8} $\cup$ {1, 2, 3, 4}
3. {Mary, Jose, David} $\cup$ {Jorge, Joel}
4. {*, ?, #, $} $\cup$ {!, ¢, % }
5. {Monday, Tuesday, Friday} $\cup$ {Thursday}
6. {A, B, C, D, E} $\cup$ {A, D, G, J, K}

Find the intersection $\cap$ of the following sets.

1. {a, e, i, o, u} $\cap$ {a, b, c, d, e}
2. {#, ¢, $, ?} $\cap$ {*, $, ?, /}
3. {the days of the week} $\cap$ {the days in the weekend}
4. {the months of the year} $\cap$ {weekdays}

GRAPHS

Reading and Drawing Graphs

Level:

Grades 7 - 9

Objectives:

1. The student will be able to name the different types of graphs:

   a. picture
   b. bar
   c. line
   d. circle

2. The student will be able to locate specified data on the graphs and analyze the data for the specified exercises.

3. The student will be able to construct his own appropriate graph for the data he will need to display.

Level of Communication:

Small or large group

Procedures:

1. The teacher will give out mimeographed sheet (plate 1) showing a general overview of types of graphs and examples of each (plates 2 through 5b).

   The students will repeat the names of the different types of graph as the teacher gives the names.

	Teacher	Student
Plate 1, graph 1	Line graph	Line graph
Plate 3,	Bar graph	Bar graph
Plate 5a,	Line graph	Line graph
Plate 4,	Circle graph	Circle graph
Plate 2,	Picture graph	Picture graph

The students will name the different graphs as the teacher holds the various plates up or points them out on the overhead projector.

Teacher	Student
Which graph is a circle graph, graph 1 or 3 on Plate 1?	Graph 3
Which graph is a picture graph, Plate 2 or Plate 3?	Plate 2
Which is the bar graph, plate 2 or plate 3?	Plate 3

2. The teacher will then help the students locate and interpret the information displayed in each graph. The importance of the following should be emphasized.

   a. title
   b. key used
   c. horizontal and/or vertical scale
   d. horizontal and/or vertical names
   e. placement of numerals
   f. symbols used

   The students will read the information on the different graphs and interpret the data.

Teacher	Student
What is the title of the line graph, Plate 5a?	Temperature on May 6 in Crofton
In the circle graph, Plate 4, how much time does a child spend at school?	A child spends 25% of his day at school.
In the bar graph, Plate 3, what is the length of the George Washington bridge?	The George Washington bridge is 4000 feet long.
In the picture graph, Plate 2, how much money did Carville spend on schools?	Carville spent 6 million dollars on schools.

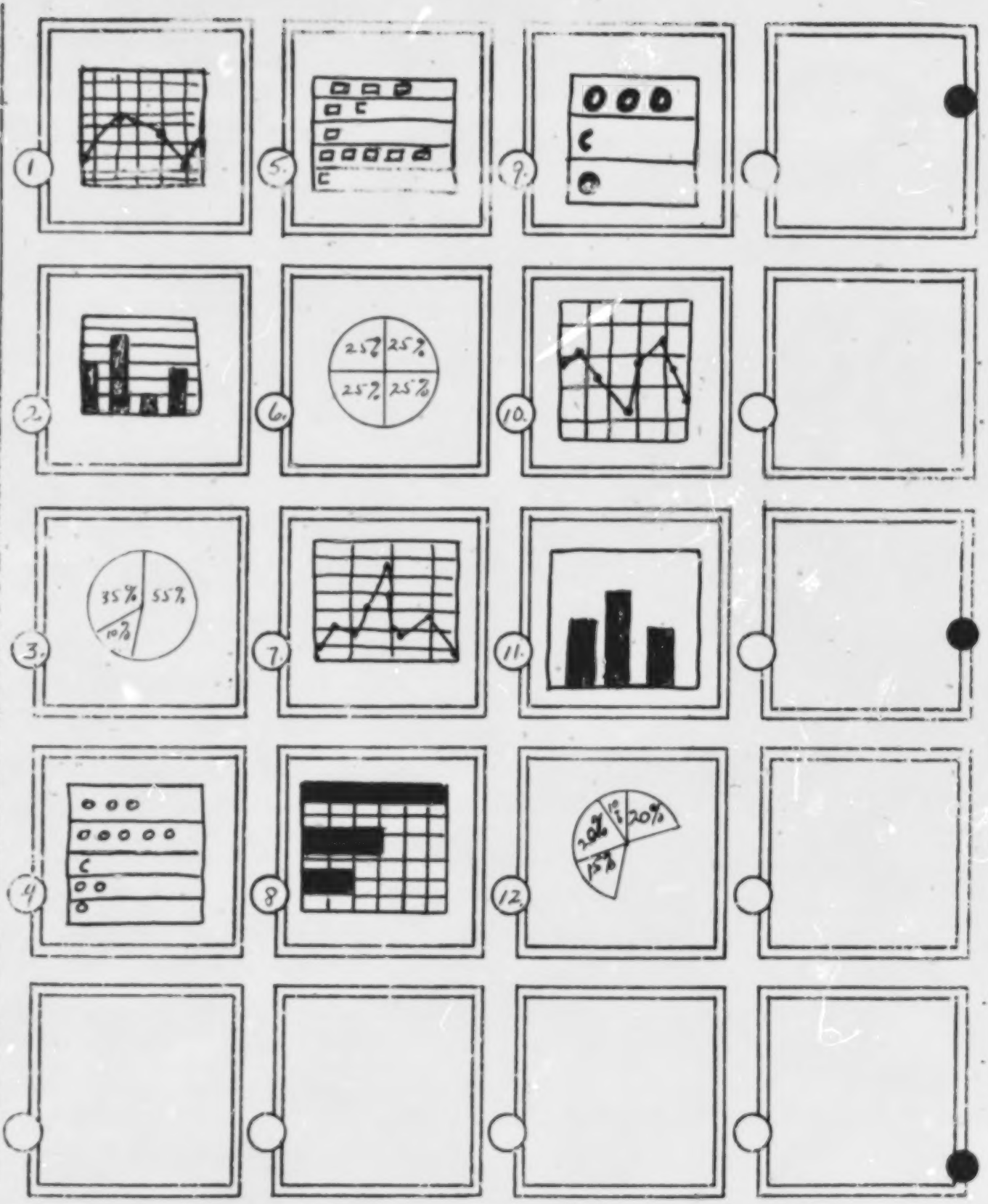
3. The teacher will help students note the construction specifics of each type of graph so that students can follow such specifics when drawing their own graphs. The teacher will have the students construct one graph of each type.

Materials:

Mimeographed handouts, transparencies, overhead projector.

Evaluation:

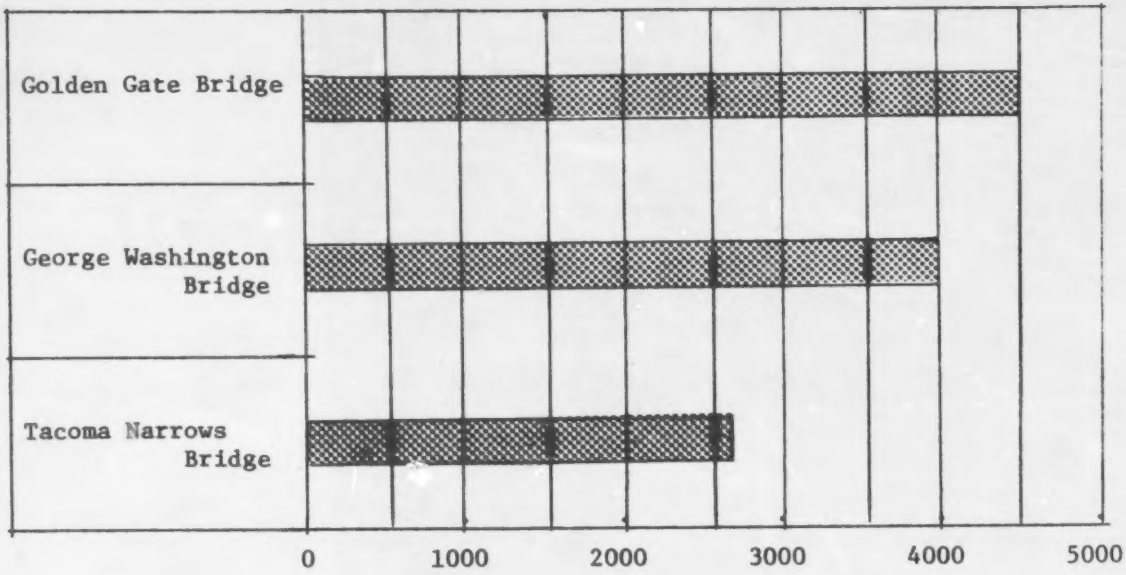
The written exercises and the assignments for making graphs can be used for evaluation.


1.
5.
9.
2.
6.
25%
25%
25%
25%
10.
3.
35%
55%
10%
7.
11.
4.
8.
12.
20%
20%
15%

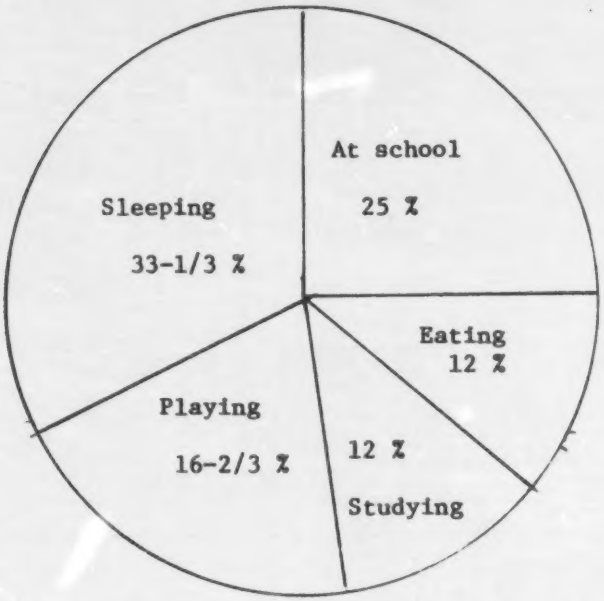
TOWNS	MONEY SPENT ON SCHOOLS
LEWTON	
CARVILLE	
HABERG	
BINGHAM	

KEY $●$ stands for $1,000,000

GREAT BRIDGES

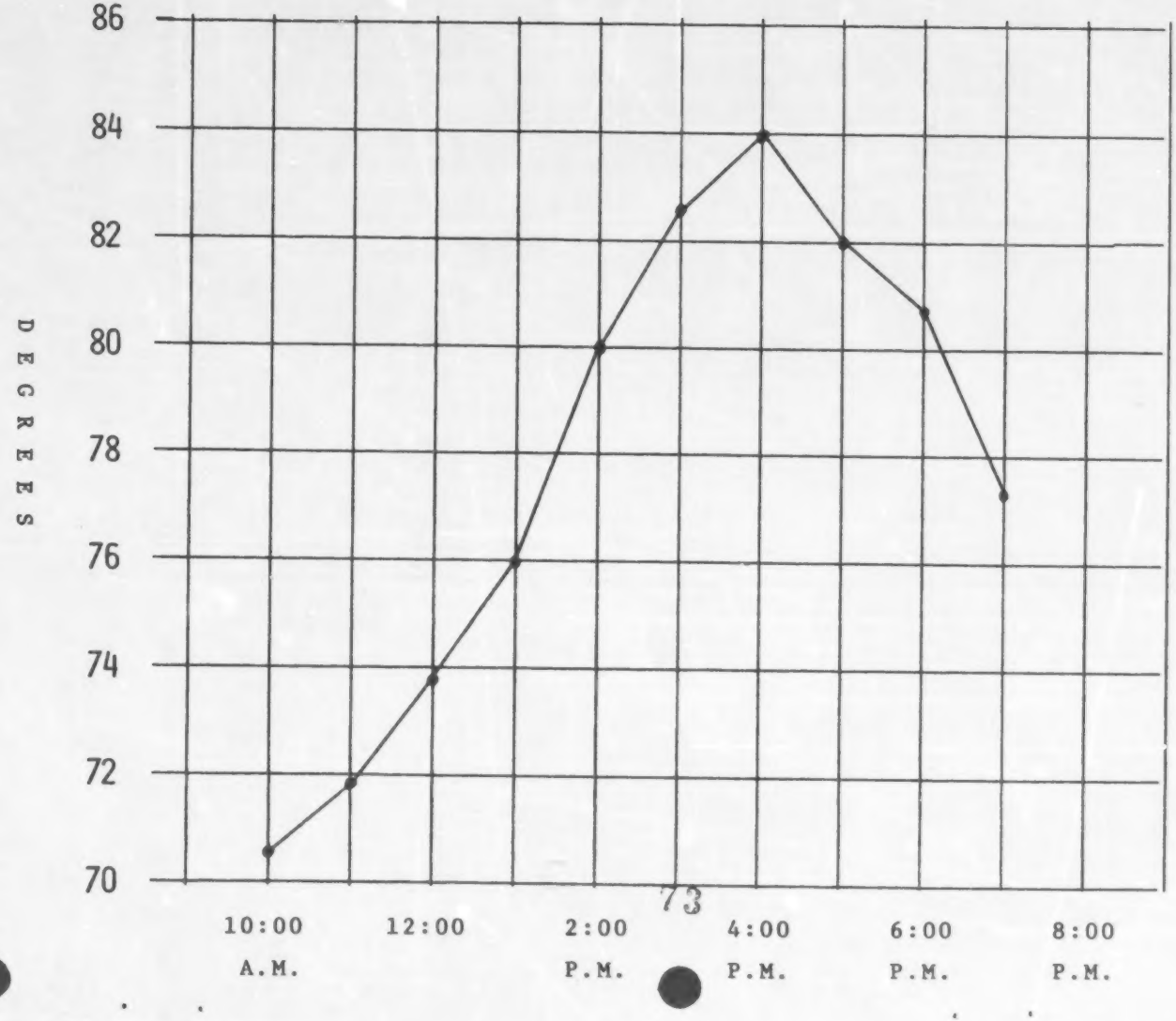


CHILD'S ACTIVITY BREAK-DOWN



TOTAL = 100%

TEMPERATURE ON MAY 6 IN CROFTON



TIME	10 AM	12 NOON	1 PM	2 PM	3 PM	4 PM	5 PM	7 PM	
0 DEGREES	71	73	76	80	83	84	82	77	

67

Plate 5b

74

75

EQUATIONS

Simplifying Equations

Level:

Grades 7 - 12

Objectives:

1. Students will be able to recognize the terms in a math expression and will be able to state the number of terms in a given expression.

2. Students will be able to combine like terms by using addition or subtraction.

3. Students will be able to complete a math expression by simplifying it into an equation.

Level of Communication:

Small or large group

Procedure:

1. The teacher will write on the chalkboard simple math expressions that contain like terms:

   a. 4X + 7X + 4X

   b. 2Y + 3Y

   Students will state the number of terms in the expressions:

   a. 3 terms in this expression — 3 términos en esta expresión

   b. 2 terms — 2 términos

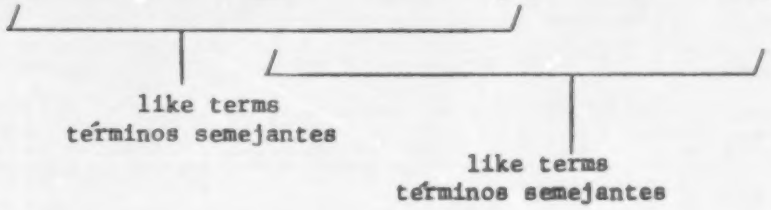
   Students will identify and repeat the terms in various expressions as the teacher gives the expressions orally. Students will also give the number of terms in each of the various expressions.

Teacher	Students
María, what are the terms in the following expression? 4M + 3M + 2M	4M, 3M, and 2M are the terms.
Carlos, name the terms in 18Y + 3X + 2Y - X.	18Y, 3X, 2Y and X are the terms.

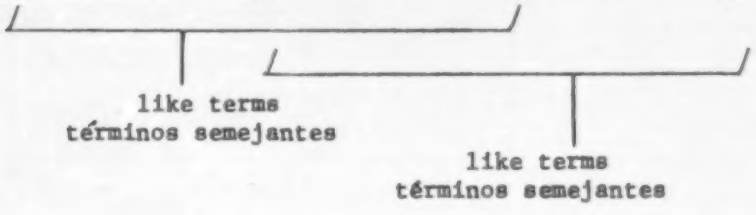
Felipe, how many terms are there in 4MM + MM + 4M?	There are 3 terms.
How many terms are there in 4A - A?	There are 2 terms.

2. The teacher next has the students recognize and identify like and unlike terms so that like terms may be combined (grouped).

a. 4MM + 2N + 3MM + N



b. 14XY + 5Y + 1XY + 3Y



The students can practice grouping like terms in an oral drill as follows:

Teacher	Students
Juan, which terms are alike in 4Z + 4Y + 3Z?	4Z and 3Z are alike.
Elena, which terms are alike in X + Y + 3X + 2Y?	X and 3X are alike. Y and 2Y are alike.

3. Students will complete equations by simplifying expressions through addition or subtraction computation.

a. 2Y + Y - Y + 5Y	2Y + Y - Y + 5Y = 7Y
b. 18MY + 7Y - 6MY + Y	18MY + 7Y - 6MY + Y = 12MY + 8Y

Students will go to the chalkboard to practice simplifying expressions into equations.

Suggestions:

The same drills can be applied to simplify equations and/or expressions using multiplication and division manipulations.

Evaluation:

Attached evaluation sheet

Math-Simplifying Equations

Combine like terms

1. $4X + 7X$
2. $3M + 2M + 14M$
3. $3Y - 2Y + Y$
4. $5X - 7X + 5X$
5. $7X + 2Y - X + Y$
6. $2T + 7T - 9T$
7. $2MN + 3MN - MN + 4MN$
8. $N - N + N - N + N - N + N + N$
9. $4Z + 3N - N + 2Z$
10. $5Y - 3X + 5X - 2Y$

Solving Equations Using Addition and Subtraction

Level:

Grades 7 - 12

Objectives:

1. Students will be able to solve equations with one unknown, using one or two operations.

2. Students will be able to apply the reciprocals to solve the given equations.

Level of Communication:

Small or large groups

Procedure:

1. The teacher will help the students solve equations with one unknown, using one or two operations.

   a. Equations such as the following will be presented on the chalkboard or by transparency on the overhead projector:

      $5 + X = 10$ $\quad$ $N + 3 = 5$ $\quad$ $18 - Y = 8$

   b. Using these equations for examples, students will name the parts of the equations.

Left side		Right side
$5 + X$	=	10
(X is the unknown)		
$N + 3$	=	5

   An equation is divided into two sides or parts by the equal sign.

   Different symbols can stand for the unknown number.

   c. Students will repeat what the teacher says regarding the unknown in each equation.

   (English: the unknown) (Spanish: la incognita)

Teacher	Student
X is the unknown	X is the unknown
N is the unknown	N is the unknown

d. Students will respond to questions from the teacher by naming the unknowns in the following equations: (Nombren, por favor, las incognitas en los siguientes)

Teacher		Students
Girls:	13 - X = 10	X
Row 1:	N + 0 = 10	N
Boys:	Y - 3 = 8	Y

Continue with part or whole group

2. Applying the reciprocals, the teacher provides examples in solving equations using the addition and subtraction operations. Students then practice solving some equations on the board.

a.
$$\begin{aligned} 5 + X &= 10 \\ 5 - 5 + X &= 10 - 5 \\ X &= 5 \end{aligned}$$

The inverse operation is used to isolate the unknown on one side of the equation.

b.
$$\begin{aligned} N + 3 &= 5 \\ N + 3 - 3 &= 5 - 3 \\ N &= 2 \end{aligned}$$

The same operation must be applied on both sides of the equation to keep it balanced.

c.
$$\begin{aligned} 18 - Y &= 8 \\ 18 - Y + Y &= 8 + Y \\ 18 &= 8 + Y \\ 18 - 8 &= 8 - 8 + Y \\ 10 &= Y \end{aligned}$$

The unknown should be positive, not negative.

Suggestions:

The same technique can be used to show the use of multiplication and division properties in solving equations.

Although it is time consuming, students will benefit greatly from reading the problems aloud in class. This activity provides practice in pronunciation and recognition of the elements of simple equations.

Materials:

Mimeographed sheets, chalkboard and/or overhead projector.

Evaluation:

An exercise sheet is attached which may be used for evaluation purposes.

MATH EQUATIONS

1. 2 + Y = 8
2. 14 - N = 10
3. X - 0 = 50
4. 18 + X = 25
5. X - 14 = 20
6. Y + 5 = 8
7. 5 + 21 = Y
8. 6 - X = 6
9. Y + 2 = 13
10. N - 5 = 105
11. Y - 10 = 70
12. 12 - X = 6
13. 4 + Y = 18
14. X + 4 = 18
15. Y - 18 = 25

GEOMETRY

Measuring and Drawing Angles

Level:

Grades 7 - 12

Objectives:

1. The student will be able to measure given angles using a protractor.

2. The student will be able to use a protractor to draw an angle with given measures.

Level of Communication:

Individual or small group

Procedure:

1. The teacher will give the students the general information sheets in English or in Spanish depending on level of comprehension.

2. The teacher will review the students' knowledge of measuring angles and the proper use of protractor. An exercise for measuring angles is attached.

3. An exercise using the protractor for drawing angles with given measures will test for comprehension of the use of the protractor and knowledge of proper labeling of angles.

Materials:

1. Protractor

2. General information sheets on angles in Spanish and in English

3. Exercises on measuring and drawing angles

Evaluation:

The exercises may be used for evaluation.

Source:

"Ángulos," Álgebra moderna. Dalciani Berman y Freilick Publicaciones Cultural - S.A. p. 498

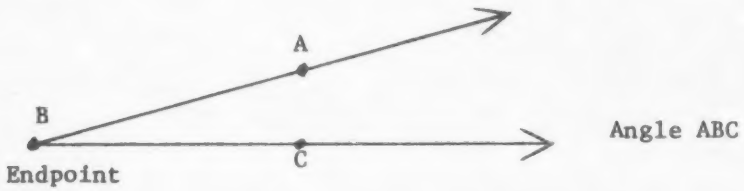
Rays and Angles

1. A ray is a line that extends indefinitely in one direction and has one endpoint.

   Example:

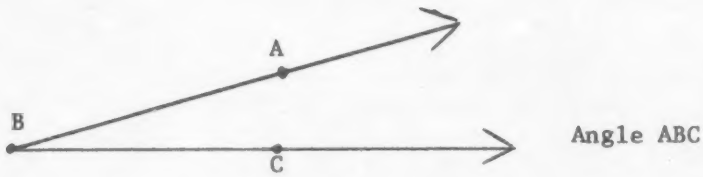
2. An angle is formed by two rays that have the same endpoints.

   Example:



3. The endpoint is called the vertex.

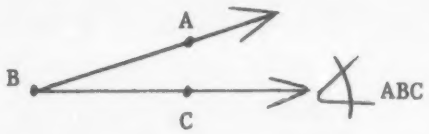
   Example:

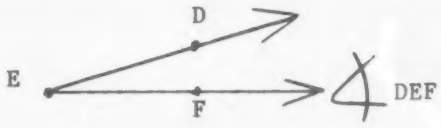


   B is the vertex

4. The symbol for angle is ∠

   Example:

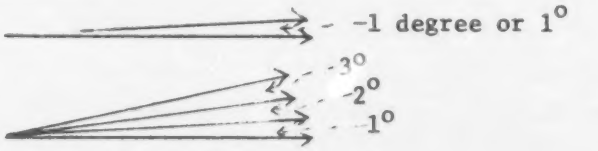




Measuring Angles

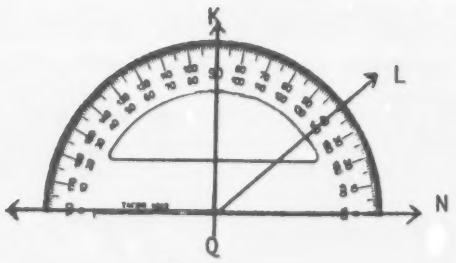
1. The degree is the standard unit for measuring an angle.
2. A protractor is the instrument for measuring angles.
3. The symbol for degree is ^{o}. For example, 20 degrees or 20^{o}.
4. Each number is a degree.

Example:



5. To measure angle N Q L follow these steps

   a. Place protractor on vertex Q.
   b. Have one ray (QN) go through O.
   c. The other ray (QL) will give you the measure (40^{o}).

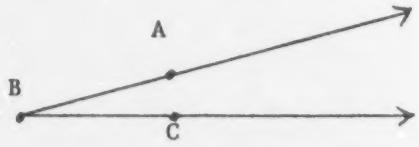


Vertex

Rayos y ángulos

1. Un ángulo ($\angle$ABC) en figura 1, es un conjunto de puntos que consiste en dos rayos procedentes del mismo punto. El punto se llama el vértice "B" del ángulo y los rayos se llaman los lados (BC y BA).

Figura 1

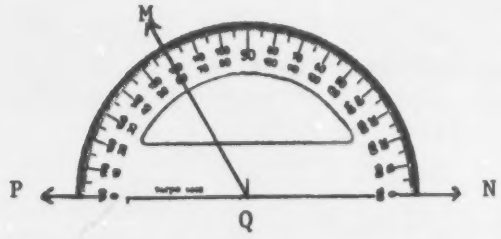


2. Para designar un ángulo se usa el signo (léase ángulo) seguido por una letra que fije su vértice tales como $\angle$ G o $\angle$ K en la figura número 2.

Figura 2

Medidas de ángulos

1. Para medir un ángulo se coloca un transportador (cada número es un grado), como se indica en la siguiente figura.



2. Para medir $\angle$NQM comience al rayo QN que es 0° y la medida es el número que corresponde al otro rayo QN que es 120°.

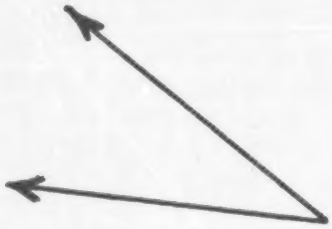
3. Para medir $\angle$PQM comience al rayo QP que es 0° y la medida es el número que corresponde al otro rayo QM que es 60°.

Exercises for Objective 1.

Find the measure of the following angles.

Ejercicios para medir ángulos. Mida los siguientes ángulos con un transportador.

1.



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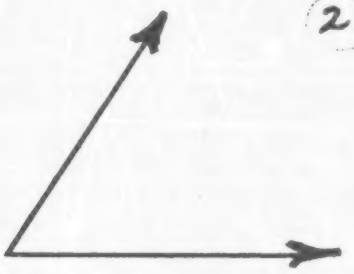
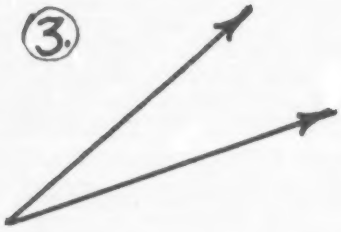
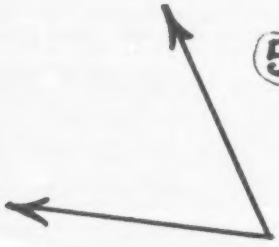


3.

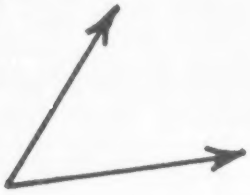


4.

5.



6.



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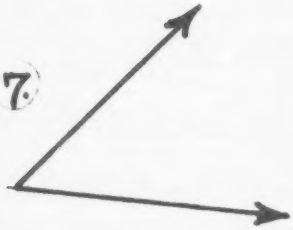
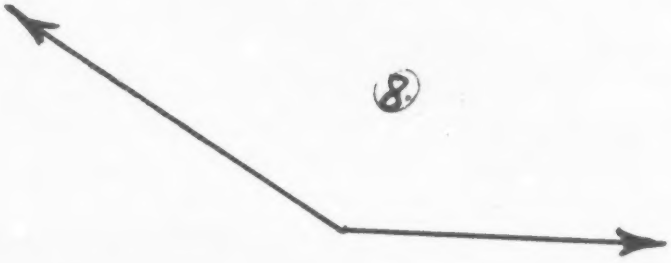


8.



Exercises for Objective 2.

Using a protractor draw angles with the following measures:

Ejercicios para dibujar ángulos: con un transportador dibuje ángulos de los siguientes medidas.

1. ABC = 45^{o}

2. PQR = 90^{o}

3. GHI = 120^{o}

4. VWX = 160^{o}

5. DEF = 85^{o}

6. KLM = 105^{o}